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(54) Title: SELF-SERVICE TERMINAL

(57) Abstract

A self-service terminal (SST) (10) has a user interface (12, 14), a bank note receiver (16) where a user may input bank notes, and a bank note validator (18) for checking the bank notes received from the user (the user's bank notes). The terminal (10) also has a cassette receiver (36) for holding a cassette (34) which is to be replenished with the user's bank notes. A loading mechanism (32) is used to replenish the cassette (34) with the validated user's bank notes. The loading mechanism (32) has a pivoting linkage arrangement so that as the bank notes are stacked in the cassette (34), part of the linkage remains parallel to the stack of bank notes. The SST (10) also has a cassette emptying mechanism (38) for emptying and reconciling partially-filled cassettes (39). A method of replenishing a cassette with bank notes and an SST system are also described.

SELF-SERVICE TERMINAL

The invention relates to a self-service terminal (SST), and particularly to an SST for replenishing and/or reconciling currency cassettes.

Currency cassettes are used as the currency source
5 in Automated Teller Machines (ATMs). The resources required to replenish (refill with currency) and reconcile (check that the number of bank notes dispensed equals the number of bank notes which were originally in the cassette) these cassettes are a major cost to the
10 owners of ATMs. Conventionally, currency cassettes are replenished at central points which serve an ATM network (which may include up to several hundred ATMs).

A currency cassette requires reconciling and replenishing when its supply of currency falls below a
15 predetermined value. When this occurs, the partially filled (below the predetermined value) cassette is removed from an ATM and replaced with a full cassette; the partially filled cassette is then transported by a secure carrier to the central point for replenishing.

20 High costs are incurred because of the need for high security in transporting currency both to and from an ATM. A financial centre may have a large amount of currency which has to be transported to the central point for replenishing an ATM, but that financial centre may
25 house the ATM which is to be replenished. Thus, in some cases, a cassette from an ATM and currency from a financial centre in which the ATM is located are both transported under high security to a remote centre which

loads the transported currency into the transported cassette to provide a replenished cassette, and the replenished cassette is then transported back to the financial centre under high security.

5   It is an object of the invention to obviate or mitigate one or more of the above disadvantages.

According to the invention a self-service terminal comprises: a user interface; a media receiver for receiving valuable media items; a validator for checking the valuable media items received by the media receiver;

10   characterised in that the terminal further comprises a cassette receiver for holding a cassette to be replenished; and a loading mechanism for replenishing the cassette with the validated valuable media items.

15   It will be appreciated that a cassette is replenished when it is filled with authentic media items, and is ready for loading into an SST without requiring any intermediate processing steps such as sorting the media items stored in the cassette.

20   By virtue of the invention a terminal is provided which may have similar dimensions to a conventional ATM, or which may be desktop in size. The terminal facilitates replenishing of a currency cassette by a user so that financial centres such as retail outlets and

25   banks may use this type of terminal to replenish cassettes used in local ATMs and thereby minimise the transportation of currency.

The terminal may have a plurality of cassette receivers so that different types of media items can be

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stored. For example, one cassette may store one denomination of currency, and a second cassette may store a different denomination of currency.

Preferably, the validator checks the valuable media items by implementing one or more predetermined acceptance criterion.

Preferably, the validator includes media identification apparatus which may include measuring apparatus for measuring the dimensions of each media item to discriminate between different types of media items (for example different denominations of currency) and/or to verify that the media item is authentic (for example by comparing the measured dimensions of the media item with pre-stored dimensions for that media item).

Preferably, the validator includes counterfeit detection apparatus. Various types of counterfeit detection apparatus may be used depending on the type of media item to be dispensed and the security features used in that media item.

Preferably, the terminal further comprises a condition sorter for checking characteristics of each media item received. If a received media item does not fulfil a predetermined condition acceptance criterion then the media item may be rejected. The characteristics that may be checked include the porosity of the media item, and whether the media item is free from tears, cuts, folds, creases, or other such defects.

The terminal may further comprise a cassette reader mechanism for use with cassettes having an identifier

which records, for example, the type of media item
stored, the number of media items stored in a full
cassette, and the number of media items stored in the
cassette when it is removed from a terminal (if it is
5   removed when it is partially full). The terminal may
have a programmer for writing information to a cassette
identifier. The terminal may be in communication with a
network of SSTs, thereby enabling the terminal to
communicate with another SST to determine the type of
10   media items and the number of media items to be stored in
the cassette.

Preferably, the cassette receiver is arranged to
hold a cassette in an inclined position to facilitate
loading of valuable media items into the cassette.

15   Preferably, the cassette receiver is operable to
detect the presence of a cassette which has been loaded
into it and to bring the loaded cassette to an inclined
position to facilitate loading of media items into the
cassette. The cassette receiver may also automatically
20   remove the lid of the cassette.

Preferably, the loading mechanism has a media
conveyor for delivering media items to a cassette, and a
conveyor deflector configured so that when a media item
is present the media item co-operates with the conveyor
25   deflector to displace at least part of the conveyor from
a first (non-deflected) position to a second (deflected)
position in which stacking of the media item in the
cassette is facilitated by allowing the media item to be
stacked to pass between the top of the media items stack
30   and the raised part of the conveyor.

Preferably, the media conveyor has a pivoting
linkage arrangement whereby a pivoting portion of the
linkage may move in an arcuate path between the top and
the bottom of the cassette; whereas, a parallel portion
5   of the linkage maintains an orientation parallel to the
orientation in which a media item is to be stacked.

The parallel portion of the linkage is located in
the cassette and is aligned so that, in use, the
orientation is parallel to and resting on the stack of
10   media items in the cassette.

Preferably, the media conveyor has an arrangement of
stretchable, endless conveyor belts, at least one (upper)
belt extending from the pivoting portion of the linkage
to the parallel portion of the linkage and being in
15   contact with a surface onto which a media item is to be
stacked. The surface onto which a media item is to be
stacked will initially be a pusher plate in the cassette,
but when one item of media is stacked on the pusher plate
the surface will be the last media item stacked.

20   Preferably, the media conveyor is counterbalanced to
provide only a small net downward force on the last media
item stacked.

Preferably, the media deflector comprises a low-
friction plate having at least one slot in a surface
25   inclined with respect to the at least one upper conveyor
belt, the plate being located below the at least one
upper conveyor belt such that the at least one upper
conveyor belt passes through the at least one slot.

The upper conveyor belt rests on the media stack and

transports media items beneath it, therefore the loading
mechanism automatically rises as a media item is stacked.
As the upper conveyor is driven it acts to urge the media
items stack against a back wall of the cassette because
5   the belt rests on the media items stack.

Preferably, the terminal further comprises a
cassette tray for receiving a cassette to be emptied, and
an emptying mechanism for removing media items from a
cassette inserted into the cassette tray. The emptying
10   mechanism may be a conventional pick mechanism.

Preferably, the terminal is operable to count the
number of media items removed from a cassette to be
emptied whereby the contents of the cassette to be
emptied can be reconciled.

15   Also according to the invention a method of
replenishing a cassette with valuable media items in an
SST is characterised by the steps of: retaining the
cassette in a position for receiving media items;
receiving media items to be used in replenishing the
20   cassette; validating the received media items; and
loading the validated media items into the cassette to
replenish the cassette.

The step of validating the received media items
includes checking characteristics of the received media
25   items, so that the media items are rejected if they do
not fulfil one or more predetermined acceptance
criterion.

Further according to the invention a self-service
terminal system comprises: a user interface; a media

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receiver for receiving valuable media items; and a
validator for checking the valuable media items received
by the media receiver; characterised in that the terminal
retains a cassette in a position for being replenished
5   with valuable media items; and replenishes the cassette
with validated valuable media items using a loading
mechanism which moves between a top and bottom of the
cassette.

An embodiment of the invention will now be described
10 with reference to the accompanying drawings, in which:

Fig 1 is a schematic diagram of an SST according to
one embodiment of the invention;

Fig 2 is a flowchart showing the process steps
involved in receiving and loading notes in the terminal
15 of Fig 1;

Fig 3 is a diagram illustrating the operation of the
cassette loading mechanism of Fig 1;

Fig 4 is a plan view of part of the mechanism of Fig
3;

20   Fig 5 is a perspective view of part of the mechanism
of Fig 3; and

Figs 6a to 6e show a media item at various stages of
transportation in the mechanism of Fig 3.

Referring to Fig 1, an SST 10 has a user interface
25 (comprising a keyboard 12 and a display 14) and a media
receiver 16 for receiving valuable media items in the
form of bank notes which may be input individually or as

a bunch.

The bank notes are transported individually from the receiver 16 to a validator 18 by a note conveyor 20, which may be an arrangement of stretchable endless belts.

5   The validator 18 has a multiple note detect stage for detecting and rejecting multiple notes and for allowing single notes to pass to the examination stage in the validator 18. In the validation stage, the validator 18 examines each single bank note to check that the note
10   is authentic. A number of examination techniques are known, and various validator algorithms are available. For example, the validator 18 may measure the lateral dimensions of the note. The validator may also implement some counterfeit detection algorithm.

15   The validator 18 has a reject note output conveyor 22 for transporting notes which fail the multiple note detect stage and for transporting notes which fail the examination stage to a reject note dispenser 24. The validator 18 also has a validated note conveyor 26 for
20   transporting valid notes to a note condition sorter 28.

The note condition sorter 28 examines each validated note to check that each note fulfils a predetermined condition acceptance criterion. For example, each note may require to be free from tears, or may require to have
25   a certain predetermined porosity. The condition sorter 28 has a reject conveyor 30 for transporting notes failing the note condition examination to the reject note dispenser 24. The condition sorter 28 also has a loading mechanism 32 for loading notes which pass the note

condition examination into a cassette to be replenished
34.

The cassette to be replenished 34 is retained in the
SST 10 in an inclined position (at an angle of 60 degrees

5   to the horizontal) by a cassette receiver 36. The SST 10
also has a cassette tray 38 for receiving a cassette to
be emptied 39. An emptying mechanism 40 in the form of a
conventional pick mechanism is used to remove bank notes
from a cassette 39 inserted into the cassette tray 38 and

10 transport these removed notes to the validator 18.

A cassette reader mechanism 41 is located in the SST
10 for use with cassettes 34 having an identifier 35. A
cassette identifier 35 typically records the type of
media items, the number of media items stored in the

15 cassette 34 when full, and the number of media items
stored in the cassette 34 when partially full (i.e. if it
is removed from an ATM before it is completely empty).
The cassette reader mechanism 41 includes a programmer
for writing information to a cassette identifier 35.

20   The SST 10 also has a processor 42 in the form of a
microcomputer for controlling and operating the user
interface (12 and 14), receiver 16, validator 18, reject
note dispenser 24, sorter 28, loading mechanism 32,
conveyors 20,22,26,30, cassette receiver 36, and cassette

25 reader mechanism 41. The SST 10 has a communication link
50 for communicating with other SSTs in a network. The
microcomputer 42 and communication link 50 are not shown
connected to any of the blocks (e.g. blocks 16,18,28,36)
in Fig 1 because Fig 1 illustrates the physical

30 arrangement rather than the electrical interconnection of

the SST 10.

The operation of the SST 10 will now be described with reference to Figs 1 and 2. An authorised operator places an empty cassette to be replenished 34 into the

5   entrance of the cassette receiver 36. The cassette receiver 36 automatically detects the cassette 34, removes the lid of the cassette 34, inclines the cassette 34 at an angle of approximately 60 degrees to the horizontal, and brings the loading mechanism 32 into

10   engagement with the cassette 34.

The cassette reader mechanism 41 reads information contained in the identifier 35 to determine the type of media items and the number of media items to be stored in the cassette 34. The display 14 then informs a user

15   about the type of media items required (in this embodiment the denomination of bank notes) and the number of media items needed to fill the cassette 34.

A user may then initiate replenishing of the cassette 34 by inputting the required quantity and

20   denomination of notes (step 60) to the receiver 16. These notes are individually conveyed to the validator 18 by note conveyor 20. The validator 18 individually examines each bank note to verify that the note is authentic (step 62). Notes which fail the validation are

25   rejected (step 64) and transported by conveyor 22 to the reject bin 24. Notes which pass the validation are transported by conveyor 26 to the note condition sorter 28 which examines (step 66) each validated note to check that it fulfils a predetermined acceptance criterion.

The notes which fail the condition sorter examination are rejected (step 64) and transported by conveyor 30 to the reject bin 24. The notes which pass the condition sorter examination are loaded (step 68)

5   into the cassette 34 by loading mechanism 32.

If the cassette 34 is not full after all of the notes input by the user have been loaded, then the SST 10 notifies the user that the cassette 34 is not full and asks if the user intends inputting more notes (step 70).

10   If the user inputs more notes then the procedure is repeated, otherwise the cassette 34 may be left in the terminal 10 until a later time when more notes are to be input or the cassette 34 may be removed (in some circumstances only a partially filled cassette 34 may be

15   required). When the cassette 34 is full the cassette receiver 36 automatically replaces the lid and moves the cassette 34 to an exit position where it may be withdrawn by an authorised operator.

It is anticipated that in this embodiment the user

20   of the SST 10 may be a person who has access to sufficient quantities of high quality bank notes suitable for dispensing from an ATM.

Fig 3 is a diagram illustrating the operation of the cassette loading mechanism 32 of Fig 1. Fig 3 shows

25   loading mechanism 32 located in a central position and delivering a bank note 80a to cassette 34 which is partly filled with notes 80 stacked on a pusher plate 81 latched back into the loading position. Fig 3 shows in dotted lines the loading mechanism 32' in an upper position

30   (where the cassette 34 is full of notes 80) and the

loading mechanism 32'' in a lower position (where the
cassette 34 is empty).

The loading mechanism 32 comprises a media conveyor
(having a pivoting portion 82 and a parallel portion 84)
5   and a conveyor deflector 86.

The pivoting portion 82 is pivotably mounted to twin
axles 88,90 at each of its ends 92,94. End 92 receives
notes 80 from the condition sorter 28 (Fig 1).

End 94 is pivotably coupled to the parallel portion
10 84. One end 96 of the parallel portion 84 supports the
twin axles 90, and the opposite end 98 of the parallel
portion 84 supports axle 100, such that each of the axles
90,100 is free to rotate about its axis.

The media conveyor (82,84) has three upper belts 110
15 extending from end 92 to end 98 and spaced along axle 100
and the upper axle of twin axle 88; and three lower belts
112 extending from end 92 to end 94 and spaced along the
lower axles of twin axles 88,90.

End 98 rests on the stack of notes 80. The upper
20 and lower belts 110,112 move in the direction of arrow
102 and individual notes 80 are transported by belts
110,112 between twin axles 88 and between twin axles 90
and are delivered to the conveyor deflector 86.

The conveyor deflector 86 is shown in more detail in
25 Figs 4 and 5. For clarity, in Fig 4 the lower belts 112
are not shown and the axles 88,90,100 are only shown as
dotted lines. None of the belts 110,112 is shown in
Fig 5, to aid clarity. The deflector 86 is in the form

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of a profiled plate having three slots 120 defined in the delivery end 122 (the part of the plate nearest the stack of notes 80).

The plate 86 is inclined relative to the belts 110
5   with the lowest part of the plate 86 being the receiving end 124 (the part of plate 86 nearest end 96) and the highest part of the plate 86 being the delivery end 122 so that each of the three upper belts 110 passes through a respective slot 120, as shown in Fig 4. The length of
10   the slots 120 is such that when no notes 80 are present on the plate 86 the upper belts 110 may pass through the slots 120 without being in contact with the plate 86 (i.e. the upper belts 110 are non-deflected) as shown by dotted line 126 in Fig 3.

15   The receiving end 124 of plate 86 is curved downwards to aid transportation of a note 80 from the pivoting portion 82 to the parallel portion 84. The delivery end 122 is located a short distance (e.g. 5mm) from the edge of the stack of notes 80 so that there is a
20   gap between the delivery end 122 and the stack of notes 80.

As a note 80a (Fig 3) is transported over the plate 86 towards delivery end 122, the note 80a begins to cover the slots 120 and thereby begins to displace (raise) the
25   lower portions of the upper belts 110. As the note 80a moves along the plate 86 and covers a larger amount of each slot 120 the displacement increases. Maximum displacement occurs when the note 80a covers delivery end 122. Thus, note 80a and plate 86 co-operate to displace
30   the lower portions of the upper belts 110.

Figs 6a to 6e show note 80a at various stages of
transportation between plate 86 and the stack of notes 80
which are located adjacent a rear wall 134 of the
cassette 34. When note 80a overhangs delivery end 122
5   (Fig 6a) the front end (80a') of note 80a begins to move
out of contact with belts 110. As note 80a is
transported further towards the stack of notes, less of
the note 80a is in contact with the belts 110, as shown
by Figs 6b and 6c. However, before note 80a loses
10 contact with belts 110 and plate 86, the front end 80a'
of note 80a comes into contact with the stack of notes
80, as shown in Fig 6d. When note 80a is transported
beyond end 122, belts 110 move back down the slots 120 to
the non-displaced position (shown by dotted line 126).
15 As the belts 110 move downwards they come into contact
with note 80a and urge it towards the rear wall 134 of
the cassette 34, thereby neatly stacking note 80a on top
of the stack of notes 80.

The top note in the stack of notes 80 is constantly
20 urged towards the rear wall 134 of the cassette 34 by the
belts 110. This ensures that the top note in the stack
does not hinder delivery of other notes. The parallel
portion 84 is counterbalanced to provide a light net
downward force on the stack of notes 80. The size of the
25 light net downward force is chosen so that the movement
of the belts 110 do not cause crumpling or deformation of
the top note in the stack; but do provide some urging of
the top note to the rear wall 134 of the cassette 34.

Thus, the belts 110 and plate 86 ensure that a note
30 80a is delivered to the top of the stack of notes 80. It

will be appreciated that the above arrangement causes the
parallel portion 84 to rise automatically as notes 80 are
added to the stack because the added notes are inserted
between the belts 110 and the stack of notes 80.

5   Referring again to Fig 3, when a cassette 34 is
empty, the loading mechanism is in the position shown by
dotted lines 32'', near the bottom 34a of the cassette
34. As notes are delivered to the cassette 34 they are
automatically stacked. During the stacking process the
10   parallel portion 84 remains parallel to the topmost note
in the stack of notes 80.

          Eventually, the cassette 34 is filled (as shown in
Fig 3 by dotted lines 32' which are near to the top 34b
of the cassette 34) and the processor 42 instructs the
15   loading mechanism 32 to cease transporting notes 80 to
the cassette 34. The cassette 34 is filled when the
number of notes 80 in the cassette 34 equals the number
of notes the cassette 34 can store (the storage capacity
as recorded in the identifier 35). The programmer in the
20   cassette reader mechanism 41 then updates the identifier
35 so that the identifier 35 records the new number of
notes 80 stored therein.

          If the cassette 34 was partly filled with notes 80
when it was loaded into the SST 10, then the identifier
25   35 stores that initial information (i.e. the number of
notes 80 initially stored in the partly-filled cassette
34), and the processor 42 ensures that only the required
number of notes 80 (the difference between the storage
capacity and the initial number of notes) are transported
30   to the cassette 34.

As the pivoting portion 82 moves from the empty position 32'' to the full position 32', end 94 follows an arcuate path. To compensate for this lateral movement of end 94 the cassette receiver 36 moves the cassette 34

5   laterally (as shown by arrows 130) to maintain a constant distance between end 94 and cassette 34.

Referring again to Fig 1, if a user has a partially filled cassette 39 which is to be emptied then the user inserts this cassette 39 into cassette tray 38. The pick

10   mechanism 40 detects the presence of the cassette 39, removes bank notes from the cassette 39 one at a time, and transports these removed notes to the validator 18. The microcomputer 42 counts the number of bank notes removed from the cassette 39 for reconciling the contents

15   of the cassette 39 with the original (when full) contents of the cassette 39. When the cassette 39 has been emptied it may be removed by a user.

Various modifications may be made to the above described embodiments within the scope of the invention.

20   Valuable media other than bank notes may be used, such as share certificates, flight coupons, stamps, and such like. The SST may include note recognition so that the SST automatically identifies the type of note entered by the user. The conveyors (e.g.20,22,30) may be

25   implemented by rollers or by suction devices. The reject note dispenser 24 may only be accessible to an authorised operator, so that any rejected media item is not returned to the user. The cassette receiver may be just a guide frame so that the operator must manually remove the lid

30   of the cassette and load the cassette into the guide

frame; in such an embodiment the cassette 34 may remain
motionless and the loading mechanism 32 may move to
compensate for the lateral movement of the end of the
mechanism 32 between the empty and full positions. An

5   optical sensor may be used to detect when the cassette to
be replenished is full of notes and to notify the loading
mechanism to stop transporting notes to the cassette.
The number of notes required for to fill a cassette to be
replenished may be obtained from an Automated Teller

10   Machine (ATM) network host via the communication link 50.
The identifier 35 may store information about which SST
the cassette 34 is intended for. The terminal 10 may
receive sufficient notes to fill more than one cassette
34, so that some cassettes 34 may be filled automatically

15   with no user intervention except to load and remove the
cassettes 34.

CLAIMS

1. A self-service terminal (10) comprising: a user interface (12,14); a media receiver (16) for receiving valuable media items (80a); and a validator (18) for checking the valuable media items (80a) received by the media receiver (16); characterised in that the terminal (10) further comprises a cassette receiver (36) for holding a cassette to be replenished; and a loading mechanism (32) for replenishing the cassette with the validated valuable media items (80a).

2. A terminal according to claim 1, wherein the validator (18) checks the valuable media items by implementing one or more predetermined acceptance criterion.

3. A terminal according to any preceding claim, wherein the terminal further comprises a cassette tray (38) for receiving a cassette to be emptied (39), and an emptying mechanism (40) for removing media items from a cassette (39) inserted into the cassette tray (38), the terminal (10) being operable to count the number of media items removed from the cassette to be emptied (39) whereby the contents of the cassette to be emptied (39) can be reconciled.

4. A terminal according to any preceding claim, wherein the terminal further comprises a condition sorter (28) for checking characteristics of each media item (80a) received and for rejecting a received media item (80a) if it does not fulfil a predetermined condition acceptance criterion.

5.   A terminal according to any preceding claim, wherein the terminal further comprises a cassette reader mechanism (41) for use with cassettes having an identifier (35) which records the type of media items and

5   the number of media items stored in the cassette.

6.   A terminal according to any preceding claim, wherein the cassette receiver (36) is operable to detect the presence of a cassette (34) which has been loaded into it, and to bring the loaded cassette (34) to an

10   inclined position to facilitate loading of media items (80a) into the cassette (34).

7.   A terminal according to any preceding claim, wherein the loading mechanism (32) has a media conveyor (82,84) for delivering media items to a cassette (34),

15   and a conveyor deflector (86) configured so that when a media item is present the media item co-operates with the conveyor deflector (86) to displace at least part of the conveyor (82,84) from a first (non-deflected) position to a second (deflected) position in which stacking of the

20   media item in the cassette (34) is facilitated by allowing the media item to be stacked to pass between the top of the media items stack (80) and the raised part of the conveyor (84).

8.   A terminal according to claim 7, wherein the

25   media conveyor (82,84) has a pivoting linkage arrangement whereby a pivoting portion (82) of the linkage may move in an arcuate path between a bottom (34a) and top (34b) of the cassette (34); whereas, a parallel portion (84) of the linkage maintains an orientation parallel to the

30   orientation in which a media item is to be stacked.

9.   A terminal according to claim 7 or 8, wherein the media deflector comprises a low-friction plate having at least one slot in a surface inclined with respect to the at least one upper conveyor belt, the plate being

5   located below the at least one upper conveyor belt such that the at least one upper conveyor belt passes through the at least one slot.

10.   A method of replenishing a cassette (34) with valuable media items in an SST (10) characterised by the

10   steps of: retaining the cassette (34) in a position for receiving media items; receiving media items to be used in replenishing the cassette (34); validating the received media items; and loading the validated media items into the cassette (34) to replenish the cassette

15   (34).

11.   A method according to claim 10, wherein the method further comprises the steps of checking characteristics of each media item received and rejecting any received media item not fulfilling a predetermined

20   condition acceptance criterion.

12.   A method according to claim 10 or 11, wherein the method further comprises the steps of: receiving a cassette to be emptied (39), removing media items from the received cassette to be emptied (39), and counting

25   the number of media items removed from the cassette to be emptied (39) for reconciling the contents of the cassette to be emptied (39).

13.   A self-service terminal system (10) comprising: a user interface (12,14); a media receiver (16) for

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receiving valuable media items; and a validator (18) for checking the valuable media items received by the media receiver (16); characterised in that the terminal (10) retains a cassette (34) in a position for being
5 replenished with valuable media items; and replenishes the cassette (34) with validated valuable media items using a loading mechanism which moves between a bottom (34a) and top (34b) of the cassette (34).

FIG. 1
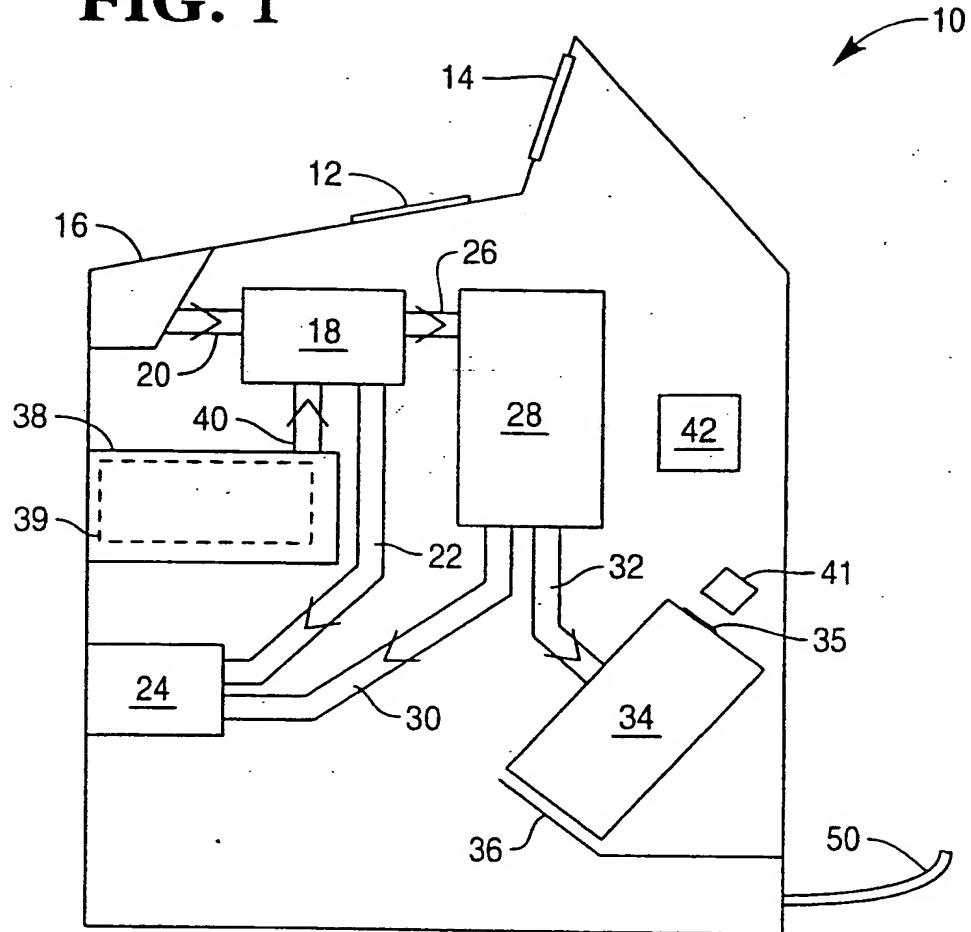
FIG. 2
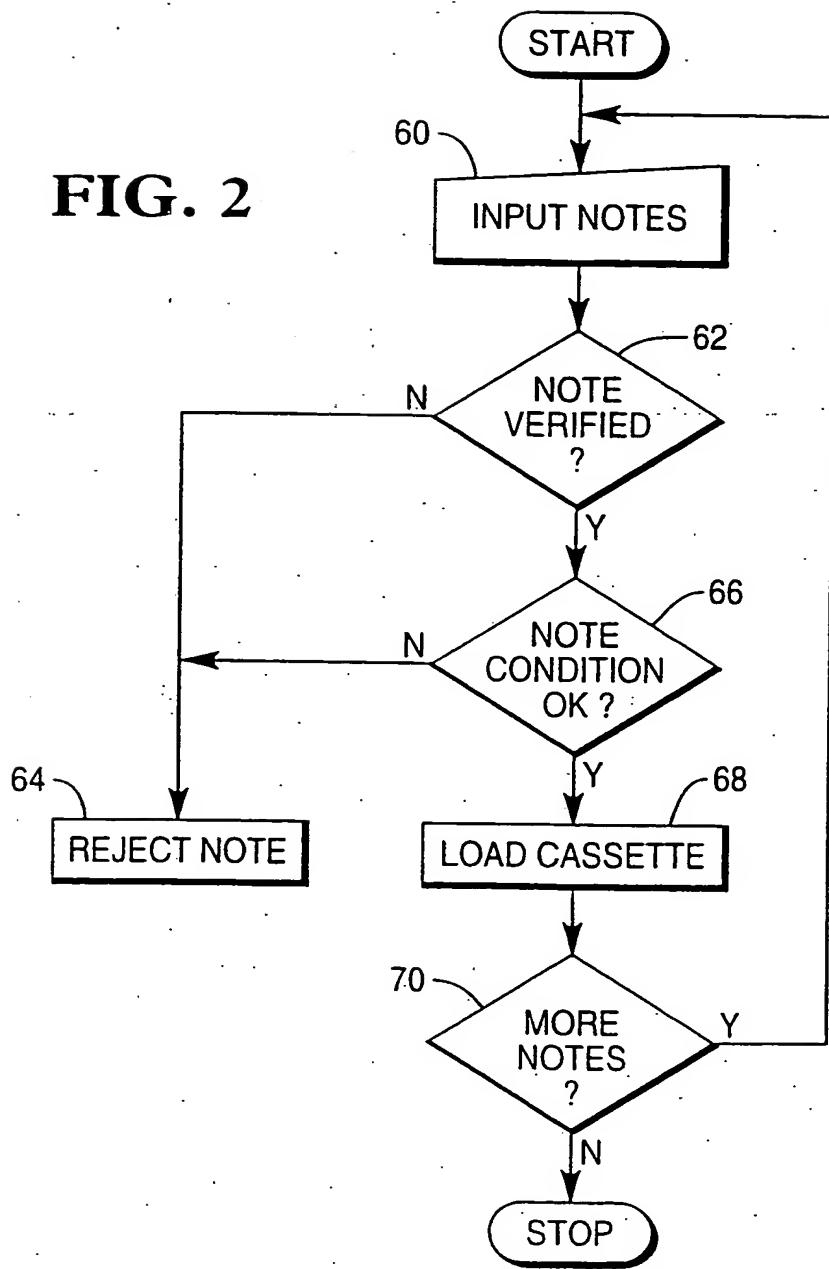
FIG. 3
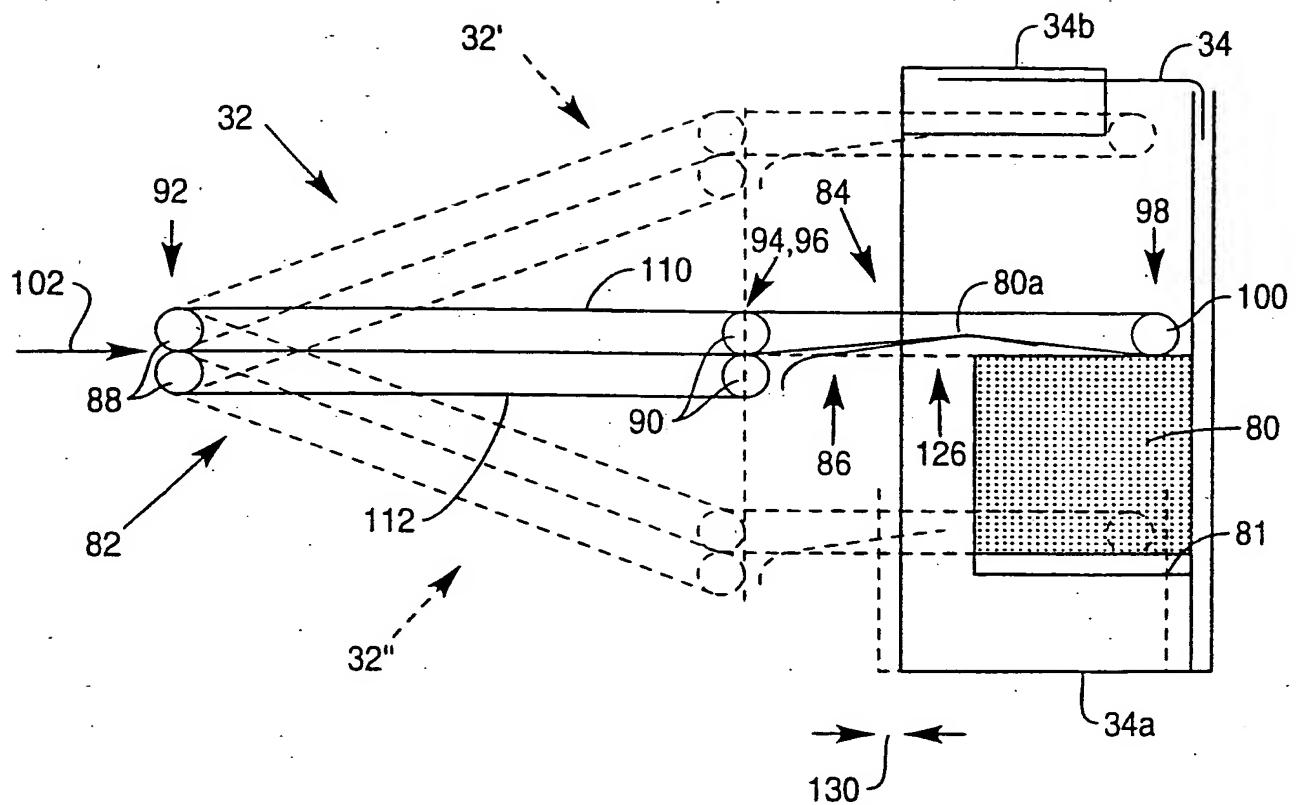
FIG. 4
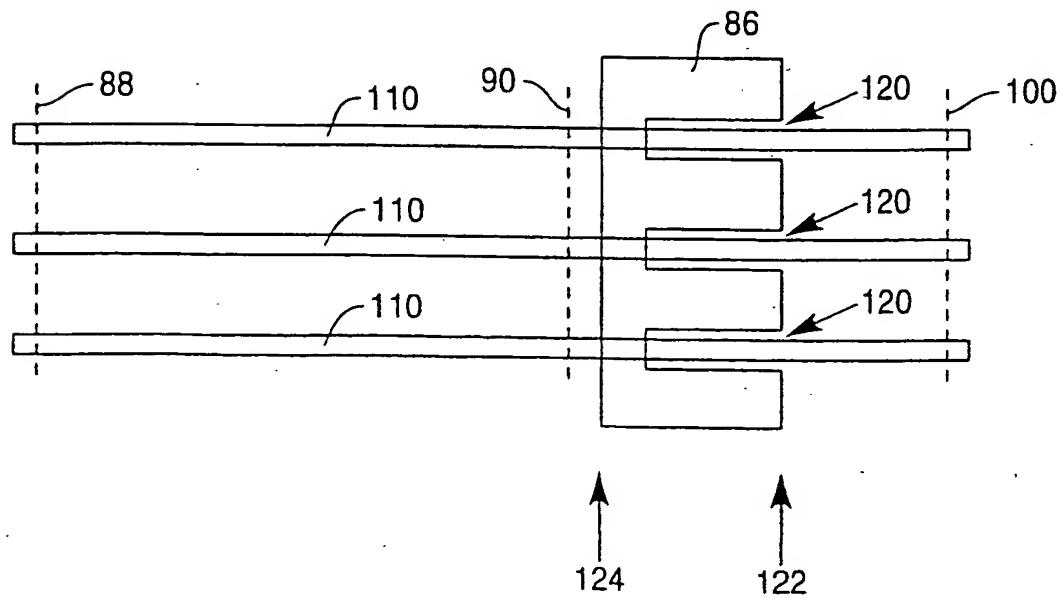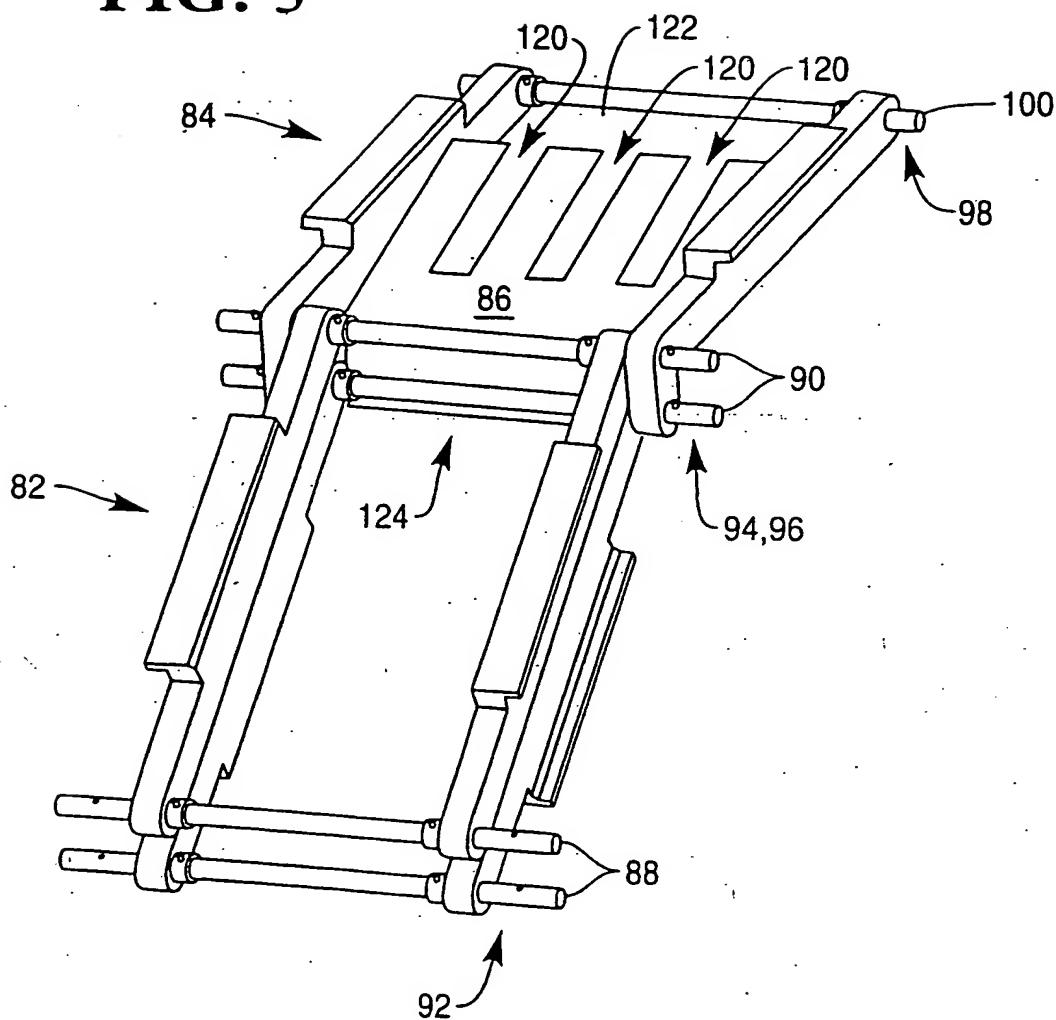
FIG. 5

FIG. 6a
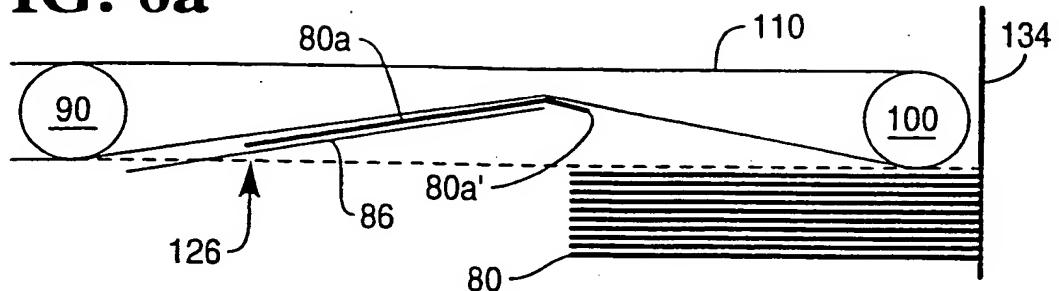
FIG. 6b
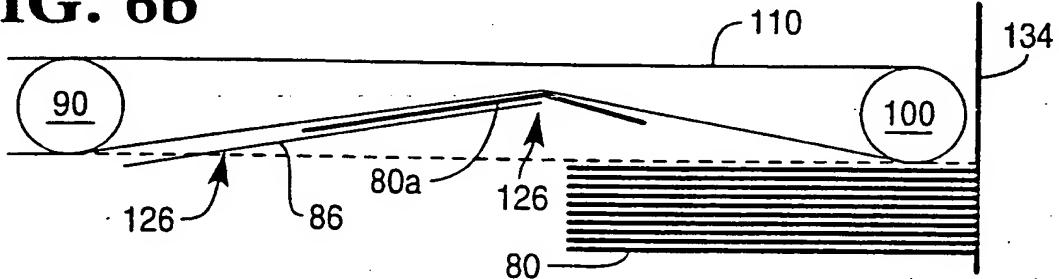
FIG. 6c
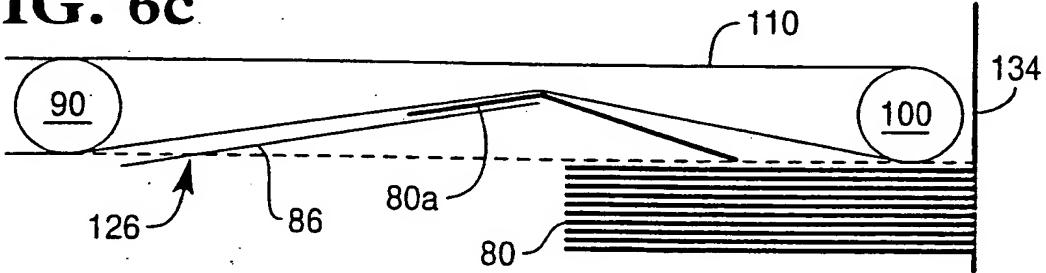
FIG. 6d
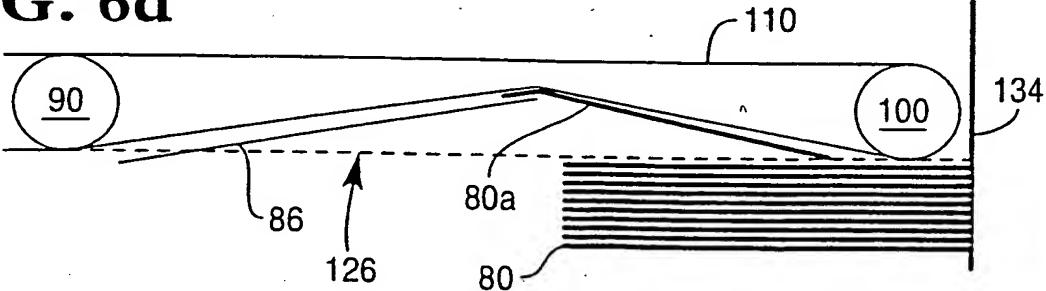
FIG. 6e
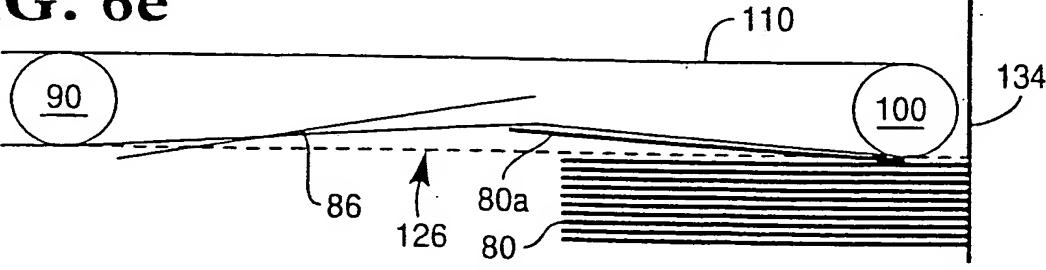
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7   G07D11/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7   G07D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 538 122 A (SIEMENS JOHN) 23 July 1996 (1996-07-23)	1,2,10, 11
Y	column 2, line 28 —column 3, line 22	5,6
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Y	the whole document	5,6
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A	the whole document ---	1
	-/--	

[X] Further documents are listed in the continuation of box C.   [X] Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 February 2000	15/02/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Bocage, S

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